



VOLUME 17 NUMBER 3 FALL 2010

Section Move

The Wellhead Protection Section is once again part of the department’s Division of Geology and Land Survey (DGLS). As many of you remember, that is where the section first began operating in 1985 when the Well Driller’s Act became law. In 2005, the section moved to the Environmental Quality Division’s Public Drinking Water Branch. Effective July 1, 2010, the section returned to the Geological Survey Program at DGLS. Jerry Prewett is Geological Survey Program Director and serves as staff liaison to the Well Installation Board. While we are officially part of DGLS, no phone numbers have changed and all operations remain in Rolla.

Contractor and Apprentice Well and Pump Installation Testing

Dates for the 2011 Contractor and Apprentice Well and Pump Installation testing are listed below. All tests begin at 9 a.m., and will be held at the Missouri Department of Natural Resources’ Division of Geology and Land Survey, 111 Fairgrounds Road in Rolla.

Please bring a picture ID with you to the testing site.

If you are applying for a non-restricted permit, please be sure to bring your Global Positioning (GPS) unit and operating manual to the test site. Your GPS unit should be programmed to read in degrees, minutes and seconds in accordance with Missouri 10 CSR 23-3.060(5).

Testing dates may be modified if necessary. If you have questions concerning this schedule or testing please call 573-368-2450. Persons with disabilities who may require special services may contact Jeannie Hoyle at the number above.

2011 Testing Dates

- January 12
- February 23
- March 16
- April 13
- May 11
- June 15
- July 13
- August 17
- September 14
- October 12
- November 16
- December 14

Well Installation Board News

The Missouri Well installation board held its quarterly meeting August 13 at the Missouri Department of Natural Resources’ Southwest Regional Office, Springfield, Mo. The Board reviewed and made decisions on four permit appeals and received updates about enforcement cases and rulemaking actions. Section activities were also presented. A status update about the fund was also provided.

The next quarterly meeting of the Well Installation Board is scheduled for 10 a.m., Friday Nov. 5 at the Missouri Department of Natural Resources’ Division of Geology and Land Survey, located at 111 Fairgrounds Road in Rolla. A subsequent meeting is scheduled for 10 a.m. Monday, Feb. 21 at the Country Club Hotel and Spa in Osage Beach. This meeting is being held in conjunction with the Missouri Water Well Association’s Annual Conference.

Southeast Missouri Regional Water District

Each year the department’s Wellhead Protection Section receives a copy of the SEMO Regional Water District’s records of irrigation wells drilled from the previous year. Missouri law requires the provision of such records to be reported to the water district, and staff request specific records to assist in the enforcement of the Water Well Drillers’ Act.

The information is then cross referenced with information in the section’s well database and the water use database. After the information is analyzed, a letter is generated and mailed to well owners that could not be located in the data sources, requesting information as to who drilled their wells. When information from the landowner is returned, the well driller is contacted regarding the well certification record so that well can be certified.

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Missouri Department of Natural Resources
Division of Geology and Land Survey
Wellhead Protection
PO Box 250
Rolla, MO 65402-0250
573-368-2165

\$\$\$MONEY\$\$\$ Available to Plug Abandoned Wells

A water supply is as important today as ever, but many things have changed since the days of the hand-dug well. Wells used decades ago may now pose a serious liability to human health or the groundwater. Whether hand-dug or drilled, all abandoned wells present hazards. Wells with wide openings pose a physical hazard, especially for small children or animals. Contaminates can also enter the groundwater in abandoned wells which may affect new wells being drilled nearby.

Missouri Well Construction Rules 10 CSR 23-3.110 establishes criteria for proper plugging of all types of water wells. Just filling a well with gravel and putting a few bags of cement or bentonite at the top is not an acceptable plugging procedure. It is very important to read the rules before plugging a well. Each year many investigations take place as a result of improperly plugged wells. Different types of wells have different plugging requirements and procedures. Funding the cost of well abandonments is available, but limited. The Department’s Public Drinking

Water Branch has funds available to communities that use groundwater as their source water. Well owners that have a well to be plugged located in the service area of a public water supply system (water district or municipal supply) are eligible for financial assistance. When a well is plugged, a landowner may receive up to \$850 for a domestic or multi-family well. Public wells are eligible for up to 75 percent of the cost of plugging or a maximum of \$10,000, whichever is less. A private well owner should contact their local water system to see if funding is available and whether they qualify. The program began in 2009 and the department is working with EPA to keep financial assistance available in the coming years. EPA has already provided two \$500,000 grants to support the plugging program. The Department is working with public water suppliers to advertise these funds. For more information about applying, please contact Mr. Ken Tomlin with the department’s Drinking Water Program at 573-526-0269 or e-mail ken.tomlin@dnr.mo.gov

Sunshine Requests for Records

If you wish to view or obtain copies of Wellhead Protection records, the following options are available to you. Please be aware that any records you request, in person or otherwise, may not be available for your immediate review, depending on the nature of your request and the availability of staff to assist you. For information requests from the Wellhead Protection Section:



- Visit the division offices in person at 111 Fairgrounds Road in Rolla;
- Telephone the section at 573-368-2165;
- E-mail your request to staff (see telephone listing on page 3);
- Fax your request to 573-368-2317; or,
- Mail a written request to: Missouri Department of Natural Resources Division of Geology and Land Survey Wellhead Protection Section PO Box 250, Rolla, MO 65402

questions or requests by calling 573-368-2165. Additionally, our website is dnr.mo.gov/geology/geosrv/wellhd/.

Legal Opinions

For the past year, the section has made a concerted effort to get out to the field more. We conducted more enforcement activities, visited contractors more often and have responded to more concerns about well construction and groundwater. During field visits, questions arose regarding our legal authority for conducting on-site inspections of well construction. For example, we encountered situations where drillers who are no longer employed with a company have improperly constructed a well. We believed we had no way to take enforcement against these actions. In some cases the driller stated that his previous employer instructed him to construct the well improperly. Before taking enforcement action or trying to get on site for inspections, we contacted our attorney for an opinion regarding our authority to conduct inspections and how to proceed with enforcement actions when the responsible party is unknown. Our question to the attorney was whether we could hold the company responsible for the work of their employees. The guidance is as follows:

Site Visits by Division Staff for Variances

When provisions of the rules cannot be met for reasons beyond the control of the contractor, there is a Missouri Well Construction Rule that states that “any request for modification of the rules shall be submitted in advance to the division in writing on a variance form obtained from the division and shall be signed by the permittee. This request shall specify in detail the nature of the modification being sought, the reasons as well as the special precautions to be taken to avoid contamination of the well.”

Permitted contractors requesting a variance will begin seeing division staff on-site during the construction of some wells requiring variance to the rules. This will be a condition of the approval of the variation from the rules. By conducting these visits the division hopes to better understand the aspects of variances and to verify that variance requirements are being met. Staff will also be verifying compliance with the Missouri Well Construction Rules during the visit. Contractors requesting a variance will be notified that staff will need to be present on-site and that notification of the drilling activity must be given in advance to allow staff to be present.

For more information regarding this process please contact 573-368-2165.

1. We do have the authority to conduct inspections. Section 256.626.1 RSMo states that the board is required to enforce rules and regulations pertaining to the construction and abandonment of wells and permitting of operators and contractors. One method of enforcing these rules is conducting routine inspections. We plan to begin conducting inspections in cases where we know when and where a well is being drilled.
2. When there is no clear responsible party, an employer can be held responsible for his employee’s actions if they occurred during the course and scope of the employment. Since a driller would obviously be working within the course and scope of his employment when drilling a well, any wrongdoing on the employee’s part can generally also be attributed to the employer. Of course, each case is different, and we will continue to hold the driller responsible in most cases. However, we do have the ability to hold the company responsible if taking this action becomes necessary to protect groundwater.

Wellhead Protection Section Online Forms

Wellhead Protection Section forms used for well certification, registration and permitting are posted on our website at dnr.mo.gov/geology/geosrv/wellhd/

Geological Survey Program

Well Drilling in Missouri

We understand you're interested in how wells are drilled. Well you've come to the right place. Our main job is to make sure that any new well is constructed to minimum standards as set by the state regulations. This helps to ensure that our groundwater resources are protected from contamination due to poor well construction. The Wellhead Protection Section regulates the construction of private water wells (this includes domestic and multiple family class wells), irrigation wells, monitoring wells and heat pump wells. In addition, we regulate how to properly plug all types of wells. Our job is to balance the concerns of the land owner and the driller, while at the same time performing our overall directive of protecting Missouri's vast underground water supply from contamination due to improper construction and abandonment of wells. Below are general subjects that may be of interest you. Please let us know if you have any questions or any ideas about how we can work together better.

Contact People

Forms, Applications, Permits

Frequently Asked Questions

Heat Pumps

Monitoring Wells

Testing Schedule 2010

Fee Structure PDF

Plugging Wells

Wellhead Protection Section Publications

Rules in Development

Well Types

Water Wells

Well Construction Rules

Wellhead Installation Board

Just click on the blue hyperlink labeled: "Forms, Applications, Permits."

This link will take you to the forms page were you can view, fill in, save and print the forms that you need.

Water, Heat Pump and Monitoring Wells

Well Certification and Registration

Abandonment Registration Record, Form-MO 780-1803 (05/09)

Closed Loop Heat Pump Certification Record, Form-MO 780-1413 (05/09)

Compressor Permit Application, Form-MO 780-1731 (05/09)

Domestic/Utility Well Record and Pump Information Data, Form-MO 780-1802 (03/10)

Closed Loop Heat Pump Certification Record, Form-MO 780-1413 (05/09)

Public Wellhead Yield Record, Form-MO 780-1901 (04/10)

Pump Information Record, Form-MO 780-1800 (03/10)

Reconstruction Record, Form-MO 780-1414 (03/10)

Driller and Pump Installation Contractor Permitting

Apprentice Permit Application, Form-MO 780-2038 (05/09)

Contractor and Apprentice Testing Application, Form-MO 780-1424 (05/09)

Compressor Permit Application, Form-MO 780-1731 (05/09)

Personal Bond - Secured by an Irrevocable Letter of Credit, Form-MO 780-2044 (06/09)

Personal Bond - Secured by Certificate of Deposit, Form-MO 780-2046 (06/09)

Personal Bond - Secured by Surety Bond, Form-MO 780-2054 (06/10)

Variance Application, Form-MO 780-1425 (04/02)

Miscellaneous Other Forms

Casing Depth Request, Form-MO 780-1426 (04/02)

Investigation Request, Form-MO 780-1618 (04/02)

Public Water Supply Notification, Form-MO 780-1427 (10/04)

Variance Request, Form-MO 780-1422 (04/02)

If you have questions about the forms available on Wellhead Protection Section’s website please contact us at 573- 368-2165

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Lead in Missouri’s Domestic Water Supplies – Part 2

This article is written by the Missouri Department of Health and Senior Services (MDHSS), and is a follow-up to the article, Lead in Missouri’s Domestic Water Supplies, published in the Winter 2009 issue of *The Connection* newsletter.

As mentioned in the original article, naturally-occurring lead deposits exist in the state and Missouri has a long history of lead mining and production dating back to the 1700s. Because of this, Missouri has sources of potential environmental lead exposures that are uncommon in other parts of the country.

Lead exposure is a significant health concern and is one of the most common and preventable environmental health problems today. Efforts to reduce lead exposure have primarily focused on common sources of lead such as lead-based paint; however, lead in groundwater is an emerging concern in Missouri.

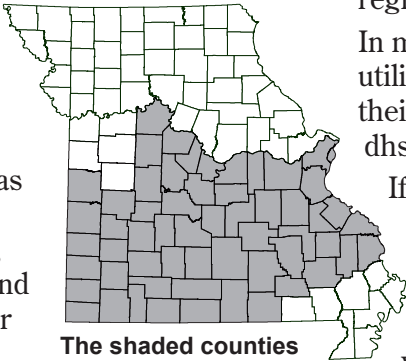
Throughout the nation, the primary source of lead in drinking water is household plumbing materials and water service lines. However, due to the naturally-occurring lead deposits in the state and from past and present lead mining activities, certain areas of Missouri may have high levels of lead in groundwater.

While widespread lead mining has primarily occurred in southern Missouri in areas such as Jasper, Newton, Madison, St. Francois and Washington counties, many other areas of the state have also been identified as having potential lead impacts. In fact, sixty counties have been identified with potential lead impacts from historic lead mining, milling or smelting.

During the past several years, lead has been found in private wells in various counties including the central Missouri counties of Camden, Cole, Miller, Moniteau and Morgan. Wells in other southwest and south central Missouri counties have also been investigated.

MDHSS is working to increase awareness of this issue and is committed to being proactive against lead exposure.

In order to strengthen Missouri’s public health, interventions focused on lead exposure, MDHSS recommends increased testing for lead in drinking water.



The shaded counties on the map are areas that may have lead in groundwater that could impact water from private wells.

To increase testing, the State Public Health Laboratory (SPHL) added lead to its list of analytes included in the New Well Series for private drinking water supplies. In addition to this, MDHSS recommended several actions that local public health agencies (LPHAs) can take to increase testing for lead.

To support these efforts, MDHSS has recently developed educational materials to promote water testing for lead. In addition, MDHSS also has developed a lead in drinking water fact sheet with recommendations for reducing exposure to assist in responding to homeowner concerns for those identified with lead impacts to their drinking water.

MDHSS encourages well drillers to make use of the MDHSS publications by providing these to well owners. These publications can be found online at dhss.mo.gov/ChildhoodLead/WhatsNew.html or can be ordered by contacting MDHSS’ Bureau of Environmental Epidemiology at 573-751-6102.

While well drillers are currently only required to test for lead in Special Area 2, MDHSS encourages well drillers to test wells for lead throughout the mining region.

In many counties, well drillers and well owners may utilize the services of the SPHL for testing through their LPHAs. A list of LPHAs can be found online at dhss.mo.gov/LPHA/LPHAs.html.

If testing is not available through a LPHA, the Missouri Department of Natural Resources’ Division of Geology and Land Survey’s Wellhead Protection Section can provide a list of laboratories certified to perform drinking water analysis.

Please contact MDHSS’ Bureau of Environmental Epidemiology at 573-751-6102 with any questions about lead in drinking water.

Historic Tri-State continued from page 3

This training qualifies persons to perform sampling in Special Area 2. The list of qualified persons continues to be updated as more individuals receive the training. The rule states that only properly trained and qualified persons may perform sample collection in Special Area 2. If you complete the chain of custody form and your name is not on our list of trained individuals, your samples will be rejected because they were not taken in accordance with Missouri Well Construction Rules for Special Area 2.

If you have any questions regarding Newton or Jasper county wells or samples please contact Paul Meyer at 573-368-2159, e-mail: paul.meyer@dnr.mo.gov .

Rule Updates

Apprentice – The draft apprentice rulemaking (10 CSR 23-1.050) is currently undergoing interagency review by other state agencies. After their comments are received, staff will return the proposed rulemaking to the Well Installation Board in November for approval. If approved, the proposed rule will be filed with the Secretary of State’s Office in December and a public hearing conducted in January.

Heat Pump – Stakeholder meetings will be held to receive comments on Chapter 5 of the Missouri Well Construction Rules. Staff will present a proposed draft (with potential revisions) to the Well Installation

Historic Tri-State Mining District — Newton and Jasper Counties

Newton and Jasper counties are part of the historic Tri-State Mining District. Lead and zinc minerals were mined throughout most of the area from as early as 1850 to the 1970s. Data on file with the Division of Geology and Land Survey indicates approximately 1,870 mining shafts and pits exist in Jasper County and 870 in Newton County.

The Tri-State Mining District of southwestern Missouri, southeastern Kansas and northeastern Oklahoma was one of the major lead and zinc mining areas in the world. For one hundred years (1850-1950), the district produced 50 percent of the zinc and 10 percent of the lead in the United States.

In 1993 and 1994, extensive sampling efforts were conducted in the Oronogo-Duenweg Mining Belt.

In 1998, additional sampling efforts were conducted in the Granby and Diamond Mining Districts. Another major round of sampling was conducted in Newton County during 2000. Between 13-37% of domestic wells tested for lead and cadmium in a given mining district show levels above existing health standards.

The Special Area 2 Rule, 10 CSR23-2.110(5) and (6) became effective December 30, 2001, with enforcement of its provisions beginning January 2, 2002. All new wells and wells deepened through the “confining layer” into the deeper aquifer must be tested for lead and cadmium (and TCE if applicable). All new and deepened old wells are to be constructed with a sampling port or tap within 10 feet of the wellhead. A water sample should be taken after a well is developed from the tap nearest the well.

A copy of a chain of custody form must be submitted with the well certification record to the Wellhead Protection Section. The testing lab selected must hold state or federal credentials for the testing of drinking water, lead and cadmium. As long as a lab is certified by any state or federal agency to test drinking water for lead and cadmium, it can be used.

Board in November for approval. If approved, the proposed rule and regulatory impact report will be available for public comment for sixty (60) days.

Monitoring Wells – The proposed rulemaking for Chapter 4, was filed with the Secretary of State’s Office in September. Staff will present comments and possible revisions to the rulemaking at the November Board meeting.

Disciplinary Action and Appeals Procedure (Chapter 1, 10 CSR 23-1.075) – Staff are working on draft language for this proposed rulemaking to present to the Board in November.

Federal standards issued by EPA in 1991 limit the amount of Lead (Pb) and Cadmium (Cd) in water as follows:

- Lead (Pb) – 0.015 mg/L or 15 PPB
- Cadmium (Cd) – 0.005 mg/L or 5 PPB

Lead and cadmium sampling training for Special Area 2 will be conducted in the near future by Wellhead Protection Staff. If you have not received the training, please plan to do so. Please call the section at 573-368-2165 to place your name on the waiting list and you will be contacted as to when the training will take place.

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Wellhead Protection Section
Phone Number Listing

Wellhead Protection Section 573-368-2165

- **Beth Marsala** – Section Chief
573-368-2171 • beth.marsala@dnr.mo.gov
- **Sheri Fry** – Unit Chief
Compliance and Planning Unit
573-368-2115 • sheri.fry@dnr.mo.gov
- **Eric Hohl**
573-368-2168 • eric.hohl@dnr.mo.gov
- **Jeannie Hoyle**
573-368-2450 • jeannie.hoyle@dnr.mo.gov
- **Matt Parker**
573-368-2170 • matt.parker@dnr.mo.gov
- **Paul Meyer**
573-368-2159 • paul.meyer@dnr.mo.gov
- **Debbie Stogsdill** – Section Secretary
573-368-2165 • debbie.stogsdill@dnr.mo.gov
- **Kyle Rollins**
573-368-2196 • kyle.rollins@dnr.mo.gov
- **Ruth Ann Williams**
573-368-2318 • ruth.williams@dnr.mo.gov

Welcome

The following individuals are now part of the Missouri Department of Natural Resources permitted contractor community:

- Absolute Comfort Systems – David Sir
- Academy Air – Terry Silverstein
- ATC Associates – Karen Rieken, Brian Mana
- Baker Heating & Cooling – David Baker
- Bemboom Heating & Cooling – Michael O’Donnell
- Burge Irrigation – Travis Crawford
- CH2M Hill – Laura Crause
- City Utilities of Springfield – Gary Pendergrass
- CM Engineering – Kirk Mescher
- Controlled Heating & Air Conditioning Inc. – Martin Faulstich
- Custom Comfort Heating & Cooling – Casey Buckles
- Custom Heating & Cooling – William Clinkingbeard
- Eco Energia of Missouri – David Hancock
- Emerald Environmental LLC – Samuel Petrie
- Environmental Operations Inc. – Jon Truesdale, Derek Bouchard, Jared Kemper
- Fayetteville Mechanical – Gary Webb
- Fresh Air Heating & Cooling – Michael Sinn, Kevin Sinn
- Foster Refrigeration & Electric – Randy Foster
- Geotechnology Inc. – Lynne Hazelip
- Gunlock Heating & Air – Kendall Gunlock, Glen Owens
- Hoffmann Brothers Heating & Air – Thomas Hoffmann
- Hutch’s NWMO Inc. – Roger Hutchcraft
- J Grantham Drilling Inc. – Jimmy Grantham
- Jim’s Heating & Cooling Inc. – Daniel Haire
- Jungmeyer Heating & Cooling – Adam Johnson
- Kirkwood Heating & A/C – Michael Bocquillon
- Kissick Construction Co. – Brian Glynn
- MoDNR – Jeffrey Crews
- MWH Americas – Stephen Varsa, Timothy Wineland
- Ozark Professional Energy – Ken Hurley
- Prudent Technologies Inc. – Patty Carrier
- Rork Drilling – Michael Rork
- Stieferman Heating – Wendel Stieferman
- Superior Heating & Air Conditioning – Sean McKay
- Symbiont Services – Douglas Thompson
- TRS – Clay Lansing
- Underground Environmental Services – Samuel Petrie
- Welsch Heating & Cooling – Matthew Finch
- Wulff-Rodgers Construction – David Rodgers

Welcome

The following individuals are now part of the Department of Natural Resources-permitted apprentice contractor community:

- B&H Well Drilling & Pump – Danny Schnieders, Brad Ocheskey
- Boessen Underground – Brian Steaemen, Christopher Williams, Charles Kiss
- Drill it Well – Shannon Wicker
- Geo Energy Source Systems – Theodore Puetz
- Industrial & Petroleum Environmental – Paul Scheetz, Donna Cody, Bradley Schuman
- Mantle Well Service – Lyle Haslag, Clayton Haslag
- Sunbelt Environmental Services – Jeremy Drury
- Smith & Co. – James Clifford

Farewell

The people addressed below are no longer permitted to operate as contractors according to the Water Well Drillers Act and Well Construction Regulations:

- Advanced Environmental Concepts – Joshua Winters
- Aecom Environment – Daniel Sakrisson
- Alliance Environmental – Richard Finch
- Alpine Mechanical – Jay Goss
- ATC Associates – Mark Shelton
- B&B Waterworks/Scott Well Drilling – Ricky Damery
- Baldwin Brothers Hardware – Jim Baldwin
- Barker Lemar Engineering – Vanessa Beyer
- Blevins, Garrett
- Boyce & Son Pump Service – Joe Boyce Jr.
- Bulldawg Drilling – Jeff Detterson
- Burns & McDonnell – Christina Stewart, Leah Bahr
- Cahoy Pump Service – Timothy Gessert
- Conastoga-Rovers & Associates – Steven Moyer
- Cox, Kevin
- Dames Heating & Cooling – John Hachman
- Delta Environmental – Joshua Gray
- Flynn Drilling – Bill Pitman
- Goss Pump Service – Keith Goss
- Haslar, Brandon
- Herst & Associates – David Vasbinder
- Iberia Well Drilling & Pump Service – Melanie Wilson
- Jim’s Heating & Cooling – Leslie Crawford
- Katzman Consulting – Michael Katzman
- Layne Christensen – Thomas Atherton
- Lefty’s Pump & Drilling – Chad Murray
- Macon Electric Cooperative – Daniel Ulhorn
- Merrell Farms – James Counce III, James Counce Jr.

Farewell continued from page 4

- MO Dept of Conservation – John Todd
- MoDNR – Todd McVicker
- MWH Americas – Dean Lewis
- Paul C. Rizzo & Associates – Anthony Fabina, Daniel Bansah
- Pauly Environmental – Steve Pauly
- Plumb, Donald
- Ritter, David
- Saindon, Rosanna
- Schroeder Rotary Drilling – Philip Stemberger, Nathan Luetjen

Positive Displacement

When the Missouri Well Construction Rules (MWCR) were drafted, several methods for grouting the annular space of a domestic water well were approved. This was so the drilling contractor would have options available, should geologic conditions prevent the more common grouting procedures from being utilized. One of these methods is referred to as “positive displacement.”

What does positive displacement mean? In the most basic sense it is creating a force to move a material from its current location to a different location. In the case of installing grout in the annulus of a domestic water well, it is forcing the grout from the initial placement (either at the bottom of the well-bore or within the casing) up around the outside of the casing. The term itself covers a variety of ways to install grout using this methodology. It can involve multiple pumping stages, plugs and fluids or be as basic as a ball of burlap cloth and the push down pressure from the drill rig. Under MWCR, the term is used to describe one of the more common methods employed on domestic wells. This article will describe that method and another more common method (in relation to domestic wells) of positive displacement. Please remember only the first method can be utilized without a variance when grouting the annular space on a domestic well in Missouri.

Method 1. This method is often referred to as the “interior positive displacement method.” After the well has been drilled to the casing point, the casing is installed to within approximately five feet above the bottom of the borehole. The required volume of grout is then poured through the casing. If there is water in the borehole and cement or bentonite slurry is used, the grout must be emplaced using a tremie (or reverse tremie) to the bottom of the borehole. Once the grout is in place, a drillable plug is placed

- Schroepfer Well Drilling – Derrick Schroepfer
- Stantec Consulting Services – William Lawrence
- Terra Drill Inc. – David Gotto
- Tetra Tech Inc. – Michelle Cocran
- Thornburg Contract Drilling – Audie Thornburg
- Tiff City Pump – Johnathan Rosenbohm, John Sams
- URS Corp – Jennifer Mumper
- Wayne County Drilling – Lloyd Ivan Atnip
- Wellington Environmental – Charles Milligan
- Williams Robert

inside the casing. The driller then places the drill bit on top of the plug and forces the drillable plug down to the bottom of the casing. This displaces the grout from inside the casing and pushes it up into the surrounding annular space. Once the drillable plug is at the bottom of the casing, the casing is then set into the bottom of the drill hole. The choice in drillable plugs is dependent on the drilling contractor. While there are commercially available plugs, many contractors prefer to construct their own. As long as the plug is made of non-toxic, inert materials the choice is left to the individual contractor.

Method 2. This method can be referred to as the “exterior positive displacement method.” While not detailed in MWCR, this method is commonly utilized for domestic wells in the United States, and therefore deserves mention. After the well has been drilled to the casing point, the calculated volume of grout required is placed directly into the bottom of the borehole, either by gravity or by using a tremie or reverse tremie. The casing, with a drillable plug installed, is then lowered into the drill hole to displace the grout. Since the plug prevents the grout from entering inside the casing, the grout is forced up around the outside of the casing as the casing is lowered to the bottom of the borehole. If the weight of the casing is not sufficient to displace the grout, the casing is often filled with water and pushed down using the drill rig. An added benefit of the force of the water pressing down offsets, to some extent the pressure being applied on the plug from below. Once again, the plug can be constructed by the driller or purchased commercially.